

A REMARKABLE NEW GALL-THRIPS FROM AUSTRALIA.

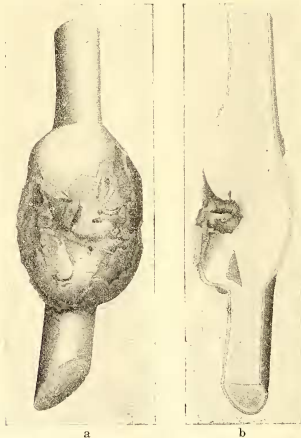
By H. H. KARNY, Ph.D. (*Communicated by W. W. Froggatt.*)

(Six Text-figures.)

[Read 26th July, 1922.]

Mr. W. W. Froggatt discovered recently a very interesting thrips-gall on the Belah (*Casuarina Cambagei*) growing in the western scrub at Trangie, N.S.W., which he was good enough to send me for determination of the gall-former.

The galls (Text-fig. 1) represent a very remarkable type, hitherto not known as caused by thrips. The twigs are swollen at some places and form



Text-fig. 1. *Thaumatothrips froggatti*, n.gen. et. sp.
Gall on a *Casuarina* twig. a. outside; b. inside. Natural size.

large, knob-shaped thickenings, inside of which are cavities, full of all stages of the gall-former. These cavities communicate with the exterior by small holes through which the thrips are able to come out.

It is a very interesting fact, that the thrips-galls of Australia belong frequently to highly specialised types, similar to those of the European Cynipidae, whilst in the tropics (e.g. in Java) only leaf-rolls caused by thrips are known.

From Australia there have been recorded only three species of Thysanoptera which form hard tumors on the phylloclades of *Acacia*, communicating with the outside by a narrow split. Mr. Froggatt described, in 1906, such a gall caused by *Kladothrips rugosus* (Agric. Gaz. N.S.W., Misc. Publ. No. 1,025, Plate, fig. 5), very remarkable by its rough surface. Similar galls, but with a more or less smooth surface, were described later by the author (Centralbl. Bakteriöl, ii. Abt., xxx., 1911, pp. 564, 570; *Oncothrips tepperi*) and by Hardy (Proc. Roy. Soc. Tasm., 1915, p. 102; *Oncothrips rodwayi**).

Onychothrips tepperi (Uzel, Act. Soc. Ent. Bohem., ii., 4, 1905; Karny, l.c.) finally forms roundish, subspherical galls on the thinnest twigs of *Acacia aneura*. But there is no gall hitherto recorded of the remarkable type discovered by Mr. Froggatt and here described.

In these galls are to be found many specimens of a Tubuliferous thrips, which proved to represent a new genus. I name it on account of some remarkable morphological characters and of its curious galls.

THAUMATOTHRIPS, n.gen.

Head not distinctly longer than prothorax, but considerably longer than wide, broadest near the eyes. Cheeks slightly converging backwards, finely granulated, set with some short, stiff hairs, but without spines. Antennae somewhat longer than head. Mouth-cone short, broadly rounded, with short and thick palpi. Prothorax very large, behind more than twice as wide as in front, with very long bristles. Fore-legs very large; their femora considerably longer than head, and nearly half as wide as long; in both sexes with a few teeth on the inner margin. Fore-tibiae short and very stout, widened to the end, on the inner apex with a sharp, but not protruding angle, lying close to the tarsus. This with two sharp tooth-like processes, the larger of which is longer than the whole tarsus itself. Pterothorax broader than long, with laterally protruding fore angles. Wings, if present, not constricted near the middle. Tube very short and thick, only slightly more than half as long as the head.

This remarkable new genus comes by its large, scutiform prothorax and by the form of fore-tibiae and tarsi into the subfamily *Kladothripinae* (Karny, Treubia, i., 4, 1921, pp. 227, 251). The sharp angle of the fore-tibia, however, does not protrude tooth-like as in *Onychothrips*, but lies close to the tarsus, as in *Oncothrips*. It may be distinguished at once from all hitherto-known *Kladothripinae*, and also from some similar *Trichothripinae* and *Cryptothripinae*, by its greatly enlarged fore-femora, set with some teeth along the inner margin. Such an armature of fore-legs was hitherto recorded only from some genera of *Macrothripinae* (*Machatothrips*, *Ischyrothrips* and *Eulophothrips*); from these, *Thaumatothrips* differs by the cheeks not set with spines, but only with short hairs, by the far smaller number of duplicated cilia on fore-wings, and by its much shorter tube.

Only one species known.

*I am very obliged to Messrs. Hardy and Rodway, from whom I got material of this interesting thrips and its galls. The species was originally described as a *Kladothrips*, but it should perhaps rather belong to *Oncothrips* because the antennae are 8-jointed—the two last joints closely united—and the other characters also agree very well with *Oncothrips*.

THAUMATOTHRIPS FROGGATTI, n.sp.

♀, ♂.—Total length of body, 2.3—3.7 mm.

General colour dark, blackish brown. Fore-femora at apex and fore-tibiae at base yellowish-brown, the latter gradually somewhat darker brown to apex. Middle and hind tibiae, and all tarsi yellowish-brown. First and second antennal segment as dark as the body; third joint yellow, somewhat darker at apex; fourth segment brownish-yellow in the basal half, dark grey in the apical half; fifth joint dark grey-brown, in the basal half somewhat paler; the following ones uniformly blackish-brown, at most the sixth joint a little paler at base. Freshly emerged specimens bright lemon-yellow, with uniformly pale antennae, the legs somewhat shaded with grey; abdominal tergites 3—8 with a broad, dark brown cross-band; tube reddish-brown.

Head distinctly longer than wide across the eyes. Cheeks beginning with a small protruding angle behind the eyes, then slightly converging posteriorly, throughout their whole length finely granulated and set with short, stiff hairs. Eyes black, occupying about a fourth of the length of head, transverse truncate behind. Between the eyes and the insertion of antennae only a very small interval; fore margin of head between the antennae scarcely produced. Ocelli always present, arranged in a rectangular triangle; the anterior one forwardly directed, the posterior ones touching the midst of the inner margin of eyes. Between the anterior and each posterior ocellus a short, hair-like bristle, another behind each posterior ocellus. Dorsal surface of head finely reticulated. Post-ocular bristles inserted near cheeks, about in the middle of length of head, long, hyaline, curved forward, somewhat dilated at apex. A little behind these bristles a second similar pair on the dorsal surface near the middle line.

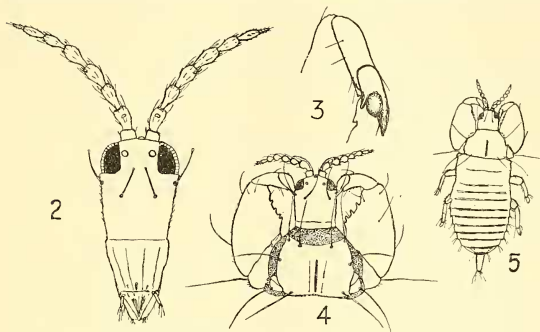
Antennae (Text-fig. 2) considerably longer than head, with stout segments. First joint wider than long, cylindrical; the following ones longer than wide, the second cup-shaped, the other club-shaped or subglobular, but always distinctly constricted at the base; the third longest, the following ones gradually diminishing towards the apex. Segments 7 and 8 broadly united with one another, together fusiform. Eighth joint considerably smaller than seventh.

First joint with a few bristles near apex. Second with a transverse row of bristles near base, and another of longer ones near apex. Segments 3—5 with such a row just before their middle, and a second one before the end. The bristles of third joint especially long and stout. Sixth segment with a crown of bristles near the apex. The following segments set only with a few weak setae. The median line of bristles on the ventral surface reaching from about the middle of seventh segment to apex of eighth.

Sense-area of the second joint transversely ovate, placed just behind the middle. Sense-cones of the following segments short and thick, blunt at apex, only a little overreaching the end of their segments. Fourth joint, in addition to the lateral pair, with one accessory sense-cone in the middle of the dorsal surface, and another on ventral surface near the posterior margin. On the fifth and sixth segments the sense-cone of posterior margin often short, nearly abortive. On the seventh joint I cannot distinguish the usual median sense-cone.

Front set with very short hairs (smaller than those of the cheeks) on the whole surface and, in addition, only a pair of short, weak bristles below the insertion of antennae. Mouth-cone short, rounded at apex, reaching at most to the middle of prosternum, usually still shorter. Palpi very short, stout, with a styliform apical and an annular basal joint. Labial palpi still shorter than the maxillary ones.

Prothorax very large, about as long as head, with a median longitudinal wrinkle on the disc, much widened from base to middle, thereafter with nearly parallel, but obtusely-angulate emarginate sides. Connecting hide between head and prothorax with distinct, dotted sculpture; a similar area on each side at the widest place of prothorax. Behind this area a triangular and then a trapezoidal, smooth, strongly chitinized area, separated from the disc by distinct sutures, of which the posterior field bears the postero-lateral bristles. All setae extraordinarily long. The antero-lateral ones inserted near the fore-angle, forwardly directed. Antero-marginal bristles from the middle of fore-margin somewhat



Text-figs. 2-5. *Thaumatothrips froggatti*, n.gen. et. sp. (nat. size.)

2. Head of macropterous form. 3. Fore-tibia and tarsus; seen in front. 4. Head and prothorax of apterous form. 5. Apterous form with contracted segments.

more distant than from the antero-lateral ones. Medio-lateral setae inserted at the end of basal third of the disc-sides. Postero-lateral bristles very long, curved, backwardly directed; postero-marginal ones as far distant from them as from the middle of hind-margin. Further, some short hairs on surface of the disc, and a pair of weak bristles near the middle of hind-margin. Surface of prosternum with a distinct, dotted sculpture. Only a few strongly chitinized, smooth plates; one longitudinally placed, elliptical at each fore-angle; one pair of large, semicircular plates before the hind-margin, with strongly convex fore-side and transversely truncate, nearly straight hind-side. Behind them a small, median, transversely-placed, elliptical plate.

Fore-coxae very large, ovate, with a strong bristle at the outer hind angle, still longer than the postero-lateral ones of prothorax, and behind it a few short hairs. Fore-femora greatly enlarged, considerably longer than head, and nearly half as wide as long; on the outer margin with some short hairs and, in addition, a very long bristle before the middle and a second shorter one before the knee;

on the inner margin with 3—5 thick teeth, the number of which often varies in the same specimen on the right and left legs; after the last tooth, just before the knee-joint, a long bristle. Fore-tibiae short and very thick, not considerably more than half as long as the femur, constricted at base, and distinctly broadened towards the apex; on the inner margin a row of small tubercles and, before the acute apex, a long bristle; on the outer margin a somewhat shorter subapical bristle. Fore-tarsus with a very large, acute, tooth-like process, and a second smaller one, between them the apical bubble of the tarsus (Text-fig. 3).

Pterothorax very stout, distinctly wider than long, with sinuated, somewhat backwardly converging sides. Behind the transverse suture, separating meso- and metanotum, a pair of backwardly directed bristles. Sutures of meso- and metasternum—besides the transverse limit between these two segments—apparently abortive, even in lightly coloured specimens not definitely distinguishable. Middle coxae cylindrical, the hind ones somewhat tumid; the former more widely separated from one another than the latter. Middle and hind legs stout, set along both margins with some short hairs and a few longer bristles. Tarsi without teeth.

Abdomen a little narrower than pterothorax, about four times as long as wide. First segment with three smooth, strongly chitinized, triangular plates, the median narrower, with the acute angle forwardly directed, the lateral ones broader and more blunt, their apex directed backwards. The space between them with a distinct, dotted sculpture. The following segments with 3 (except only 2 on the second) long bristles at each hind angle, and with some shorter hairs along the hind margin and one on the lateral margins. Wing retaining spines weak and slender, the space between the tips of the hind pair about four times as long as the spines themselves; fore pair not distinguishable on account of the dark colour of body. Bristles of the ninth segment nearly as long as the tube. This latter short, only slightly more than half as long as head, with straight, distinctly converging sides; at base about half as wide as long, and somewhat more than twice as wide as at apex. The longer terminal bristles a little shorter than the tube itself, the shorter ones not yet half as long as the others.

I have allowed myself the pleasure of naming this remarkable new species after its discoverer, Mr. Walter W. Froggatt, who has kindly sent it to me for description.

There are no morphological differences between the two sexes, well distinct forms occurring equally in both sexes.

Forma aptera (Text-fig. 4). It is not unusual amongst Thysanoptera, that a macropterous and an apterous form of a species may be found although, of gall-thrips especially, very few apterous forms are known. But it seems very remarkable and exceptional that the apterous form here described differs from the macropterous form, not only by the absence of wings, by smaller eyes and ocelli, a shorter pterothorax and abortive wing retaining spines, but also by other characters. Therefore, I find it necessary to describe it somewhat extensively.

Head somewhat shorter, about one and one-third times as long as wide. Eyes and ocelli smaller than in the macropterous form, the former occupying only one-fifth of the length of head. Antennae very stout, their middle joints not or hardly longer than broad. All bristles of the whole body exceedingly long, acutely pointed at apex, not knobbed. The inner ones of first antennal joint reaching about to the end of third joint. Both pairs on the dorsal surface of head distinctly overreaching the end of first antennal joint. Bristles of abdo-

men longer than the segments themselves. Fore-femora somewhat more than half as wide as long. Pterothorax comparatively shorter and wider than in the macropterous form. Wings absent. Wing retaining spines reduced to simple bristles.

Measurements of an apterous female of middle size: Total length of antennae, 0.35 mm.; joint 1, 0.04 mm. long, 0.05 mm. wide; joint 2, 0.055 mm. long, 0.045 mm. wide; joint 3, 0.055 mm. long, 0.04 mm. wide; joint 4, 0.045 mm. long, 0.04 mm. wide; joint 5, 0.04 mm. long, 0.04 mm. wide; joint 6, 0.04 mm. long, 0.035 mm. wide; joint 7, 0.04 mm. long, 0.03 mm. wide; joint 8, 0.03 mm. long, 0.015 mm. wide. Head 0.28 mm. long, 0.22 mm. wide. Prothorax 0.35 mm. long, 0.50 mm. wide without fore-coxae, 0.68 mm. wide including fore-coxae. Fore-femora 0.48 mm. long, 0.26 mm. wide; fore-tibiae (including tarsi) 0.24 mm. long, 0.08 mm. wide. Pterothorax 0.42 mm. long, 0.56 mm. wide. Middle femora 0.18 mm. long, 0.07 mm. wide; middle tibiae (including tarsi) 0.21 mm. long, 0.05 mm. wide. Hind-femora 0.21 mm. long, 0.09 mm. wide; hind-tibiae (including tarsi) 0.28 mm. long, 0.06 mm. wide. Abdomen (including tube) 1.8 mm. long, 0.55 mm. wide. Length of tube 0.17 mm., width at base 0.10 mm., at apex 0.04 mm.

Forma macroptera. Head distinctly longer, at least one and a half times as long as wide. Eyes occupying a little more than one-fourth of the length of head. Ocelli also larger than in the apterous form. Antennae distinctly longer, their middle joints at least one and a half times as long as wide. All bristles long and stout, but shorter than in the apterous form, distinctly dilated at apex, knobbed; only those of the ninth abdominal segment and of tube sharply pointed. The inner bristle of first antennal joint not considerably overreaching the end of this segment. Fore-femora somewhat less than half as wide as long. Wings present, reaching about to base of sixth abdominal segment, not constricted in the middle, nor dilated before the apex, clear, hyaline, with long, dense fringe. Fore pair with three long, knobbed, equidistant bristles near the fore-margin at base, a little longer than the wing is broad; hind-margin near apex with a dozen duplicated cilia. Wing retaining spines weak, but distinctly S-shaped, inwardly directed.

Besides the macropterous and apterous forms, there are larger and smaller ones.

Forma major. Larger. Fore-femora somewhat larger, more than one and a half times as long as head.

Measurements of a large macropterous female: Total length of antennae 0.49 mm.; joint 1, 0.04 mm. long, 0.05 mm. wide; joint 2, 0.06 mm. long, 0.05 mm. wide; joint 3, 0.08 mm. long, 0.045 mm. wide; joint 4, 0.08 mm. long, 0.05 mm. wide; joint 5, 0.075 mm. long, 0.04 mm. wide; joint 6, 0.07 mm. long, 0.035 mm. wide; joint 7, 0.06 mm. long, 0.025 mm. wide; joint 8, 0.03 mm. long, 0.015 mm. wide. Head 0.38 mm. long, 0.24 mm. wide. Prothorax 0.40 mm. long, 0.51 mm. wide without fore-coxae, 0.68 mm. wide including fore-coxae. Fore-femora 0.58 mm. long, 0.26 mm. wide; fore-tibiae (including tarsi) 0.32 mm. long, 0.08 mm. wide. Pterothorax 0.55 mm. long, 0.61 mm. wide. Middle femora 0.17 mm. long, 0.07 mm. wide; middle tibiae (including tarsi) 0.25 mm. long, 0.055 mm. wide. Hind-femora 0.26 mm. long, 0.09 mm. wide; hind-tibiae (including tarsi) 0.31 mm. long, 0.06 mm. wide. Length of wings (without fringe) 1.4 mm. Abdomen (including tube) 2.3 mm. long, 0.53 mm. wide. Length of tube 0.21 mm., width at base 0.11 mm., at apex 0.04 mm.

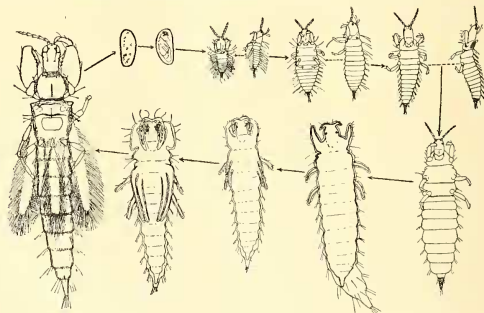
Forma debilis. Smaller. Fore-femora less than one and a half times as

long as head. These two forms correspond to already known forms of some Tubulifera, e.g., the Australian *Haplothrips braccatus* ♂ (Karny, Treubia, ii., 1, 1921, p. 30) or the Javanese *Mesothrips pyctes* (Karny, Zeitschr. wiss. Ins. Biol., xii., 1916, p. 191).

Measurements of a small macropterous female: Total length of antennae 0.38 mm.; joint 1, 0.025 mm. long, 0.04 mm. wide; joint 2, 0.045 mm. long, 0.035 mm. wide; joint 3, 0.06 mm. long, 0.035 mm. wide; joint 4, 0.06 mm. long, 0.04 mm. wide; joint 5, 0.06 mm. long, 0.035 mm. wide; joint 6, 0.055 mm. long, 0.03 mm. wide; joint 7, 0.05 mm. long, 0.022 mm. wide; joint 8, 0.025 mm. long, 0.013 mm. wide. Head 0.27 mm. long, 0.18 mm. wide. Prothorax 0.25 mm. long, 0.33 mm. wide without fore-coxae, 0.45 mm. wide including fore-coxae. Fore-femora 0.37 mm. long, 0.16 mm. wide; fore-tibiae (including tarsi) 0.20 mm. long, 0.06 mm. wide. Pterothorax 0.35 mm. long, 0.42 mm. wide. Middle femora 0.16 mm. long, 0.06 mm. wide; middle tibiae (including tarsi) 0.22 mm. long, 0.05 mm. wide. Hind-femora 0.18 mm. long, 0.07 mm. wide; hind-tibiae (including tarsi) 0.23 mm. long, 0.055 mm. wide. Length of wings (without fringe) 1.0 mm. Abdomen (including tube) 1.5 mm. long, 0.38 mm. wide. Length of tube 0.14 mm., width at base 0.07 mm., at apex 0.03 mm.

I have given here the measurement of all forms from female specimens, in order to show that all these differences occur in the same sex, and may not be mistaken for sexual dimorphism. All these forms are to be found in the galls together.

There are further, in the material before me, specimens with extraordinary contracted segments of body and antennae (Text-fig. 5), the head therefore



Text-fig. 6. *Thaumatothrips froggatti*, n.gen. et. sp.

Life-cycle of macropterous form. (x 2/3.)

appearing still shorter than in the above-described apterous form, and the abdomen greatly dilated, resembling somewhat the Australian Liothripine genus *Aspidothrips* (Karny, Act. Soc. Ent. Cech., xvii., 1920, p. 38). But these may not be mistaken for a different form. These specimens are only a product of

the methods of preservation; they were probably all dead when they came into alcohol.

The thrips undergo their whole development in their galls, and all stages (Text-fig. 6) are therefore present in these cavities. There is only one species of Australian Tubulifera, as far as known to the author, namely *Idolothrips spectrum* Haliday, of which we already know the whole development (Froggatt, Proc. Linn. Soc. N.S.W., xxix., 1904, pp. 54-57, Plate iii.). But this is an Idolothripid and agrees therefore with the Phloeothripid *Thaumatothrips* only in the general characters common for all Tubulifera, but diverges in some special differences according to development of antennae and end of abdomen, to colour of the stages, etc. The life-cycle of *Thaumatothrips* agrees somewhat more closely with that of some Javanese Phloeothripidae, as described by the author (Bull. Jard. Bot. Buitenzorg, (2) x., 1913, pp. 79, 85, 101).

Eggs ovate, about 500 μ (or a little more) long, and 250 μ (or a little less) wide, rounded at both ends, but somewhat broader near the head of embryo, somewhat tapering towards its hind end. The shell of the egg shows a distinct, polygonal structure, as already known from the European *Trichothrips ulmi* (Ahlberg, Ark. Zool., xiii., 17, 1920, p. 9) and the African *Gynaikothrips ebneri* (Karny, Denkschr. Akad. Wiss. Wien, 98, 1921, sep. p. 22). The one side (dorsal of embryo) of egg is somewhat more rounded, the other (ventral of embryo) nearly straight. Colour lemon- to orange-yellow. Before emergence of larva, it is already very well visible through the egg-shell.

First larval stage somewhat longer than egg, because the hind end of embryo in the egg is ventrally curved forwards. General colour pale yellow, without a red hypodermal pigment. Antennae very short and stout, nearly as long as the head (including mouth-cone); their middle joints about as long as wide. Basal three segments very pale yellowish, scarcely perceptibly shaded with greyish; fourth a very little more greyish; 5-7 still more shaded with grey. Head in the anterior part near the insertion of antennae distinctly greyish, with two pairs of long bristles. Mouth-cone reaching to base of prosternum, broadly rounded at apex. Thorax on each segment laterally with a very long bristle, nearly as long as the head (including mouth-cone). Abdomen short, with very long bristles on each segment, only a little shorter than those of thorax, and about twice as long as the tube. Ninth segment transversely dark grey in the apical half. Tube short, broad at base, much tapering to apex, dark grey, with two longer and some smaller bristles at the end.

Second stage of the same general colour as the first; but prothorax a little shaded with grey. Antennae nearly as in the first stage. Mouth-cone not fully reaching to base of prosternum. Bristles of thorax very long, but comparatively shorter than in the first stage, shorter than the head (including mouth-cone). Abdomen long and wide; its bristles about half as long as those of thorax and only a little longer than the tube; but the seventh segment on each side with a very long bristle, only a little shorter than those of the thorax. Ninth segment and tube as in the first stage.

Third stage coloured as the preceding ones, without hypodermal pigment, but with a well-defined, transverse, rhomboidal, greyish spot behind the insertion of antennae, and with two larger scutiform ones on the disc of pronotum. Antennae longer and slenderer than in the preceding stages, their middle joints considerably longer than wide; the three basal joints pale yellowish, the four apical ones very dark grey. Mouth-cone only a little overreaching the midst of prosternum. Bristles arranged as in the preceding stages, but comparatively

shorter; those of the seventh segment not sensibly longer than the others, nearly as long as those of the thorax. Abdomen long and slender, sides of each segment arched, only the tube truncate-conical. Colour and chaetotaxy of the end of abdomen as in the preceding stages.

Fourth stage of a similar colour to third, but somewhat darker, brownish-yellow. Also without red pigment. Antennae as in the preceding stage, but their three basal segments brownish-yellow, not or only a little paler than the four apical ones, which are a little paler grey than in the third stage. Mouth-cone not overreaching the middle of prosternum. Bristles of thorax not distinctly longer than those of abdomen; those of the seventh segment not longer than the others. Abdomen very long and broad, with arched margins of segments, but the ninth together with the tube truncate-conical. Bristles of these two last segments distinctly shorter than the others of abdomen.

Pre-pupa uniformly brownish-yellow. Cases of antennae shorter than the head, horn-shaped. Mouth-cone not fully reaching to the middle of prosternum. Bristles of prothorax considerably longer than those of meso- and metathorax, which are not longer than those of abdomen. Abdomen as in the last larval stage, but gradually tapering to apex, and with the two last segments of the same colour as the others.

First pupal stage brownish-yellow. Cases of antennae not yet reaching to the fore-margin of prothorax. Mouth-cone reaching about to the midst of prosternum. Fore-femora distinctly smaller than the head; fore-tarsi with a short, broad, obtuse tooth. Wing-cases reaching to the middle of the margins of second abdominal segment—in the apterous form naturally wanting. All bristles in both forms long and sharply pointed, but in the apterous form already distinctly longer than in the macropterous one.

Second pupal stage of the same colour as the preceding one. Chaetotaxy also the same. Cases of antennae distinctly overreaching the fore-margin of prothorax. Mouth-cone reaching about to the middle of prosternum. Fore-femora already enlarged, about as long as head or a little longer; fore-tarsus with a very large, sharp tooth. Wing cases, as present, reaching to the fourth abdominal segment. All other characters as in the first pupa.